SEE 6DISS – Section C – Applications Hands-on

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1. Lab information

Network Topology

The network topology is shown in Figure 1. PCs belong to different VLANs, each of them having a different IPv6 address prefix. For example, the first three routers in the 2^{nd} row belong in the VLAN 3 and use the 2001:648:E000:3::/64 address space.



Linux Server

A PC having Scientific Linux 4.2 (<u>https://www.scientificlinux.org/</u>) is running BIND 9.2.4 (<u>http://www.isc.org/sw/bind/</u>). Access to the linux server is allowed via **SSH** (port 22) at the address **2001:648:E000::1/64¹** using the **login/password: see6diss.**

¹ IPv6 address/network

Exercise A: IPv6 DNS

Objectives

There are IPv4 DNS (A, PTR) entries in the /var/named/ directory for all lab PCs. Students are asked to create the relevant IPv6 DNS (AAAA, PTR) entries. (Students should have basic knowledge of BIND/DNS!)

DNS configuration basics

The DNS server is configured via the /etc/named.conf file. The "forward- or reverse-zone" files that contain the DNS entries are defined in the /etc/named.conf via the following syntax:

```
zone "testbed.6diss.org" in {
    type master;
    file "db.6diss";
};
zone "10.10.10.in-addr.arpa" in {
    type master;
    file "db.10.10.10";
};
```

In order to add IPv6 DNS entries for PCs belong in VLAN \mathbf{X} , the zone file db.6diss \mathbf{X}^2 and the reverse-zone db. \mathbf{X} .E000.648.2001 have to be created. (The file /etc/named.conf already contains the appropriate entries.)

```
zone "testbed.6dissX.org" in {
    type master;
    file "db.6dissX";
};
zone "X.0.0.0.0.0.0.E.8.4.6.0.1.0.0.2.ip6.arpa" in {
    type master;
    file "db.X.E000.648.2001";
};
```

Exercises steps

- 1. Create and populate the files "testbed.6diss**X**.org" and "X.0.0.0.0.0.0.E.8.4.6.0.1.0.0.2.ip6.arpa"
 - (Tip: See configuration examples at the end of the document)
- 2. Validate the configuration files using the command "named-checkzone"
- (Tip (example): # named-checkzone testbed.6diss1.org db.6diss1)
- 3. Restart DNS server

² The IPv4 and IPv6 forward zone files could be the same. However, in the 6DISS training the forwardzone files for IPv4 and IPv6 are separated in order to allow different groups to create their own configuration.

- (Tip: kill -HUP `cat /var/run/named.pid`. Note that in order to restart the DNS server, root privileges are required. Therefore, DNS named will be restarted on demand by the tutors!)
- 4. Check DNS server logs
 - (Tip:grep named /var/log/messages)
- 5. Validate DNS queries using your lab PC. Do the same using the local linux server. What is the transport protocol for the DNS queries?
 - (Tip: Use the nslookup and change the DNS server to 213.240.38.90)
- 6. Use IPv6 as DNS queries transport protocol. What is the problem in the DNS queries at the lab PC? Is there the same problem in DNS queries in the Linux machine?
 - (Tip: Use the nslookup and change the DNS server to 2001:648:E000::1)

Exercise B: Examples of IPv6 applications

Objectives

Lab participants are asked to use simple IPv6 applications and verify their proper operation.

Exercises steps

- 1. Access a IPv6 web site and capture traffic using ethereal tool
- 2. Access an AS Path web site. Find the number of IPv6 AS numbers and the number of routing entries in the IPv6 routing table. Identify the IPv6 upstream provider for SEEREN network. What is worth noticing?
 - (Tip: http://www.join.uni-muenster.de/bgp/bgp.html)
- 3. Use a Looking Glass web site. Identify the same information as in previous step.
 - (Tip (example): http://http://netmon.grnet.gr/lg.shtml)

Supporting info

Examples BIND files

Forward-zone file for testdomain.org testdomain.org. IN SOA server.testdomain.org. root.server.testdomain.org. (; Serial 1 10800 Retry after 1 hour ; Refresh after 3 hours 3600 604800 ; Expire after 1 week 86400) ; Minimum TTL of 1 day ; ; Name servers testdomain.org. IN NS server.testdomain.org. ; ; Host addresses localhost.testdomain.org. IN A IN A localhost.testdomain.org. IN A laptop.testdomain.org. IN A 127.0.0.1 10.10.10.1 10.10.10.202 camera.testdomain.org. IN A 10.10.10.201

; Multi-homed hosts IN A 10.10.10.200 router.testdomain.org. ; Aliases ; www IN CNAME server ; IPv6 host addresses localhost.testdomain.org. IN AAAA Interim org. IN AAAA IN AAAA localhost.testdomain.org. IN AAAA ::1 2001:648:E000:1000::1

Reverse-zone file for testdomain.org

0.0.0.1.0.0.0.E.8.4.6.0.1.0.0.2.ip6.arpa. IN SOA server.testdomain.org. root.server.testdomain.org. (; Serial 1 10800 ; Refresh after 3 hours ; Retry after 1 hour 3600 604800 ; Expire after 1 week 86400) ; Minimum TTL of 1 day ; ; Name servers 0.0.0.1.0.2.3.2.8.4.6.0.1.0.0.2.ip6.arpa. IN NS server.testdomain.org. ; ; Addresses point to canonical name IN PTR laptop.testdomain.org. IN PTR server.testdomain.org. Localhost

2001:648:E000:1000::2

0.0.0.ip6.arpa. IN SOA server.aliako.gr. root.server.aliako.gr (; Serial 1 10800 ; Refresh after 3 hours ; Retry after 1 hour 3600 604800 ; Expire after 1 week 86400) ; Minimum TTL of 1 day 0.0.0.ip6.arpa. IN NS server.aliako.gr.

Compact "Ethereal" documentation

Ethereal is used by network professionals around the world for troubleshooting, protocol analysis, software and protocol development, and education. Its open source license allows talented experts in the networking community to add enhancements. It runs on all popular computing platforms, including Unix, Linux, and Windows. See further information at <u>http://www.ethereal.com/</u>.

In order to capture packets, use the menu (Capture -> Start) If you want to capture only a specific set of packets, use *capture filters* (Capture->Options), as shown in Figure 2.

© Ethereal: Capture Options			
Capture Interface: Intel(R) PRO/100 VE Network Connection (Microsoft's Packet Scheduler) : \D(
IP address: 195.251.29.55			
Capture packets in promiscuous mode			
Limit each packet to 68			
Capture Filter: p6			
Capture File(s)		Display Options	
File:	Browse	Update list of packets in real time	
Use multiple files			
Next file every	1 🗘 megabyte(s) 👻	L Automatic scrolling in the capture	
Next file every	1 🗘 minute(s) 👻	Lide capture info dialog	
Ring buffer with	2 🗘 files	Name Resolution	
Stop capture after	1 🗘 file(s)		
Stop Capture			
🗌 after 1	packet(s)	Enable <u>n</u> etwork name resolution	
after 1	🗘 megabyte(s) 💌	Enable transport name resolution	
🛄 after 🛛 1	🗸 minute(s) 🚩		
Help		Start Cancel	

Figure 2: Ethereal packet capture filters

(Tip: Use the capture filter "ip6" to capture only IPv6 packets or "icmp6" capture only ICMPv6 packets)

After having captured some traffic, you can also filter the results using the "Filter" option, as shown in the Figure 3.

🛛 (Untitled) - Ethereal			
Elle Edit View Go Capture Analyze Statistics Help			
≝₩84₩₩I125₩×69≦ 614⇒90	₮ ⊻ 🗐 🖩 @ Q @ 🕾 🕷 🗷 🐯 💥		
Eiter: Expression Clear Apply			
No Time Source	Destination Protocol Info 📤		
1 0.000000 fe80::204:ddff:fe64:400	ff02::1 ICMPv6 Rou		
C	3		
Frame 1 (118 bytes on wire, 118 bytes captured)			
 Enternet II, Src: Clsco_04:04:00 (00:04:dd:04:00), Dst: IPV6-Neighbor-Discovery_0 Enternet Protocol Version 6 			
Version: 6			
Traffic class: 0xe0			
Flowlabel: 0x00000			
Payload length: 64			
Hop limit: 255			
Source address: fe80::204:ddff:fe64:400			
Destination address: ff02::1			
Internet Control Message Protocol v6 Type: 124 (Pouton adventicement)			
Type: 134 (Router advertisement)			
Checksum: 0x107d [correct]			
Cur hop limit: 64			
■ Flags: 0x00			
Router lifetime: 1800			
Reachable Time: 0			
= ICMPv6 options			
Type: 1 (Source link-layer address)			
Length: 8 bytes (1)			
TINK-layer address: 00:04:dd:64:04:00			
# ICHPV6 options			
4			
0010 00 00 00 40 5a 11 1e 80 00 00 00 00 00	00 02 04		
0030 00 00 00 00 00 01 86 00 10 7d 40 00 07	08 00 00		
0040 00 00 00 00 00 00 01 01 00 04 dd 64 04	00 05 01		
P: 1 D: 1 M: 0 Drops: 0			

Figure 3: Ethereal interface

(Tip: Use the filter "ip6" to show only IPv6 packets, "icmpv6.code==0" to show ICMP packets of specific code or "http" to show HTTP traffic.)

Lab specifications

PCs are running WinXP (SP2) while Ethereal Version 0.10.13 is installed. Router is an Cisco 2610 using 2600-jk8s-mz.122-13.T14.bin IOS.